

LIFE-HISTORY OF HETEROCAMPA OBLIQUA *Pack.*

By A. S. PACKARD.

The eggs of a female of this species which is of the form *brunnea*, were received from Providence, R. I., through the kindness of Mr. W. Dearden, July 13, and hatched at Brunswick, Me., July 20—21. It feeds on the oak. It was reared at Brunswick.

Egg.—Diameter, .9 mm. Of the usual hemispherical shape, moderately flattened above; shell under a lens seen to be finely pitted or shagreened; under $\frac{1}{2}$ inch, a eye-piece, marked with rather large hexagonal areas, with well marked, raised edges, but not distinctly beaded. The hole eaten in one side by the larva in escaping of the usual elongated kidney-shape.

Larva, Stage I.—Freshly hatched. Length, 3.5 mm. Head very large, much wider than the body, somewhat flattened in front; pitchy amber, smooth, unarmed, surface dull, not polished. On the 1st segment arising from a dark cervical plate is a pair of large branching horns with three large equal curved tines, which are pointed and densely spinose, the short stout spinules dark, quite different from *H. guttivitta*. One tine points forwards, one backwards and one laterally outwards. The body is purplish reddish, with no stripes or other marks, except a small pale yellowish transverse dorsal spot in front of the base of the 8th segment. No horns on the 2nd and 3rd thoracic segments. On the 1st abdominal segment is a pair of simple dark horns about as long as the segment is thick. On 2nd segment a pair of minute setæ; on 3rd a pair of blunt spines one-half as long and large as those on the 1st, and a slightly smaller pair on the last (10th) segment. End of body carried uplifted, and the two cylindrical anal legs blunt at the end and entirely dark. Thoracic legs blackish; the four pairs of middle abdominal legs dark livid. It molted July 27.

Stage II.—Length, 6 mm. Head reddish brown. Now all the horns have disappeared, those on the 1st thoracic segment only represented by two conical acute tubercles which are black at the tip and slightly forked, there being a small black supplementary spine on the inside of the main one. The two spines are wide apart and project out laterally. On 9th abdominal segment are

two twin minute black spinules situated close together. Body pale reddish, color of an oak twing, variegated with yellowish; a distinct linear dorsal line and a broad diffuse line on thoracic segments; an irregular series of large dorsal yellowish spots, those on abdominal segments 1—4, and 6, 7 and 9 being the largest. Anal legs moderately long, reddish.

Stage III.—It molted Aug. 1. Length, 8—9 mm. The head is now large, wider than the body, subtrapezoidal in front, rounded above, and slightly bilobed; pale in front, yellowish on the sides. An irregular pale reddish brown band on the vertex and on the sides enclosing in front four irregular reddish spots of the color of a dead leaf which may be called sere brown. Prothoracic spines now stout and pale reddish, ending in three black spinules. From each spine proceeds, a broad reddish brown band the color of a dead leaf, and enclosing a large oval yellowish spot which extends along the back of abdominal segments 1 to 4. This spot encloses two reddish lines which dilate four times enclosing a roundish white spot in each dilatation. On segments 5—7 is a long triangular whitish spot enclosing two short reddish lines which dilate twice, enclosing two narrow oval spaces. The back of segments 8 and 9 is reddish, the sides yellowish green, whitish; anal legs held up at rest; greenish with a red stripe within. The reddish portion of the body consists of irregular fine reddish and greenish-yellow lines, the former predominating.

Stage IV.—It molted Aug. 8, A.M., and ate up the cast skin before beginning to eat the oak leaves. Length, 12 mm. (Two days before this molt the lateral sere brown spots appeared as in this stage, but fainter.) By Aug. 12th it had become 20 mm. in length. The three prongs of the prothoracic spines as in stage III, reddish. Head a little broader and rounder than before, but with the same style of markings. The markings of the body as in stage III, but the greenish portion of the sides speckled with black. Dorsal spots as before; an irregular lateral sere brown spot just above the base of the 3rd thoracic legs, and still higher up on 1st abdominal segment is a contiguous spot, making an oblique band as in the other species. The reddish brown edging of the diamond shaped dorsal spot on abdominal segments 1 to 4 extends down to the base of the 1st pair of the abdominal legs. In this stage there is present a straw yellow infraspicular line, just touching the spiracles, and best marked on the abdominal segments, and above

on 2nd thoracic segment are similar yellow lines, not reaching the front edge of the prothoracic segment, nor extending behind the oblique sere brown band.

Stage V and last.—Described Aug. 29. Length, 40 mm. Now there are no prothoracic tubercles, but in place of each of them a very slight elongate flattened callosity. Head rounded, smooth, not so wide as the body; luteous, with a flesh-tint and slightly purplish; an ashy irregular band on each side of the head, above the ocelli, with scattered spots between. The body is thickest in the middle (much like Abbot's drawing) and pale flesh, marked with numerous irregular reddish pink wavy hair lines. The usual dorsal band is reddish, bordered with yellow, and enclosing a pale almost whitish band. From the prothoracic segments the two lines contract, dilating on the 3d thoracic segment, and becoming widest apart on the 2nd and 3rd abdominal segments and again widely separating on the 7th abdominal segment; the two lozenge-shaped spots thus formed enclose two parallel median pinkish lines. On the suranal plate the two lines unite to form a median pale sere brown band. Thoracic and abdominal legs pale, marked with red.

The freshly hatched larva differs from that of *H. guttivitta* in having no traces of tubercles or horns on abdominal segments 4 to 6; in the first pairs having tines of quite different shape, being thicker, and more spinose; these horns being dull chitinous, of the same hue as the head. The other dorsal tubercles are about one-quarter as long, not elbowed, and stouter in proportion, while those on the 8th segment are smaller.

EXPLANATION OF PLATE I.

- Fig. I. *Heterocampa obliqua* Pack.—Freshly hatched larva; *Ia*, dorsal view; *Ib*, spine on third, *Ic*, spine on eighth, *Id*, spine on ninth abdominal segment; *Ie*, prothoracic horns of stage I, enlarged.
- Fig. II. *Heterocampa obliqua* Pack.—Stage II; *Ila*, horns on first prothoracic segment.
- Fig. III. *Heterocampa guttivitta* Walk.—Horns in stage I; *a*, prothoracic horn; *b*, one on second abdominal, *c*, one on third to fifth, and *d*, on ninth abdominal segment.